

Claims

What is claimed is:

1. A fluid pump comprising:

a housing defining a pumping chamber, a pumping chamber inlet port and a pumping chamber outlet port;

a rotatable impeller disposed in said pumping chamber for rotation about an axis;

a polarized electromagnet means associated with said impeller and said housing for rotating said impeller about said axis;

first means for generating a magnetic force selected from the group consisting of diamagnets and solenoids fixed with respect to the impeller or the housing; and

second means for generating a magnetic force selected from the group consisting of permanent magnets, solenoids and electromagnets fixed with respect to the housing or impeller and disposed in opposing magnetic communication with said first means for generating a magnetic force, to thereby stabilize said impeller by levitating magnetic forces.

2. The fluid pump of claim 1 wherein said first means for

generating a magnetic force and said second means for generating a magnetic force

are oriented generally axially and generally radially, respectively, with respect to said housing and said impeller, whereby said impeller is axially stabilized and radially

stabilized by levitating magnetic forces.

3. The fluid pump of claim 3 wherein said impeller has a density substantially similar to the density of the fluid pumped by said fluid pump.

suba¹ 4. A fluid pump comprising:
a housing defining a pumping chamber, a pumping chamber inlet port and a pumping chamber outlet port;
a rotatable impeller disposed in said pumping chamber for rotation about an axis;
a polarized electromagnetic means associated with said impeller and said housing for rotating said impeller about said axis;
a plurality of diamagnets fixed with respect to said impeller; and
a plurality of magnet means fixed with respect to said housing and disposed in magnetic communication with said plurality of diamagnets, to thereby stabilize said impeller by levitating magnetic forces.

5. The fluid pump of claim 4 wherein said plurality of diamagnets and said plurality of magnet means are oriented generally axially and generally radially with respect to said housing and said impeller, whereby said impeller is axially stabilized and radially stabilized by levitating magnetic forces.

sub a² 6. The fluid pump of either claim 4 or 5 wherein said magnet means is selected from the group consisting of permanent magnets, solenoids and electromagnets.

sub a² 7. The fluid pump of claim 6 wherein said impeller has a density substantially similar to the density of the fluid pumped by said fluid pump.

8. A fluid pump comprising:
a housing defining a pumping chamber, a pumping chamber inlet port and a pumping chamber outlet port;
a rotatable impeller disposed in said pumping chamber for rotation about an axis;
a polarized electromagnetic means associated with said impeller and said housing for rotating said impeller about said axis;
a plurality of solenoids fixed with respect to said impeller; and
a plurality of magnet means fixed with respect to said housing and disposed in magnetic communication with said plurality of solenoids, to thereby stabilize said impeller by levitating magnetic forces.

9. The fluid pump of claim 8 wherein said plurality of solenoids and said plurality of magnet means are oriented generally axially and generally radially with respect to said housing and said impeller, whereby said impeller is axially stabilized and radially stabilized by levitating magnetic forces.

10. The fluid pump of either claim 8 or 9 wherein said magnet means are selected from the group consisting of permanent magnets, diamagnets, solenoids or electromagnets.

11. The fluid pump of claim 10 wherein said impeller has a density substantially similar to the density of the fluid pumped by said fluid pump.

12. A fluid pump comprising:

a housing defining a pumping chamber, a pumping chamber inlet port and a pumping chamber outlet port;

a rotatable impeller disposed in said pumping chamber for rotation about an axis;

a polarized electromagnetic means associated with said impeller and said housing for rotating said impeller about said axis;

a plurality of solenoids fixed with respect to said housing; and

a plurality of magnet means fixed with respect to said impeller and disposed in magnetic communication with said plurality of solenoids, to thereby stabilize said impeller by levitating magnetic forces.

13. The fluid pump of claim 12 wherein said plurality of solenoids and said plurality of magnet means are oriented generally axially and generally radially with respect to said housing and said impeller, whereby said impeller is axially stabilized and radially stabilized by levitating magnetic forces.

14. The fluid pump of either claim 12 or 13 wherein said magnet means is selected from the group consisting of permanent magnets, diamagnets, solenoids and electromagnets.

15. The fluid pump of claim 14 wherein said impeller has a density substantially similar to the density of the fluid pumped by said fluid pump.

16. A fluid pump comprising:

a housing defining a pumping chamber, a pumping chamber inlet port and a pumping chamber outlet port;

a rotatable impeller disposed in said pumping chamber for rotation about an axis;

a polarized electromagnetic means associated with said impeller and said housing for rotating said impeller about said axis;

a plurality of diamagnets fixed with respect to said housing; and

a plurality of magnet means fixed with respect to said impeller and disposed in magnetic communication with said plurality of diamagnets, to thereby stabilize said impeller by levitating magnetic forces.

17. The fluid pump of claim 13 wherein said plurality of diamagnets and said plurality of magnet means are oriented generally axially and generally radially with respect to said housing and said impeller, whereby said impeller is axially stabilized and radially stabilized by levitating magnetic forces.

18. The fluid pump of either claim 16 or 17 wherein said magnet means is selected from the group consisting of permanent magnets, solenoids and electromagnets.

19. The fluid pump of claim 18 wherein said impeller has a density substantially similar to the density of the fluid pumped by said fluid pump.

20. A fluid pump comprising:

a housing defining a pumping chamber, a pumping chamber inlet port and a pumping chamber outlet port;

a central frame disposed in said pumping chamber;

a rotatable impeller disposed in said pumping chamber for rotation

~~about said central frame;~~

a polarized electromagnetic means associated with said housing and said impeller for rotating said impeller about said central frame;

a plurality of diamagnets fixed with respect to said central frame;

a plurality of magnet means fixed with respect to said impeller and in magnetic communication with said plurality of diamagnets, to thereby stabilize said impeller by levitating magnetic forces;

21. The fluid pump of claim 20 wherein said plurality of diamagnets and said plurality of magnet or means are oriented generally radially with respect to said central frame and said impeller, whereby said impeller is axially stabilized by levitating magnetic forces.

22. The fluid pump of claim 21 further comprising a plurality of magnet means fixed with respect to said housing and said impeller in a generally axial direction whereby said impeller is radially stabilized by levitating magnetic forces.

23. The fluid pump of either claim 20, 21 or 22 wherein said magnet means are selected from the group consisting of permanent magnets, solenoids and electromagnets.

24. The fluid pump of claim 23 wherein said impeller has a density substantially similar to the density of the fluid pumped by said fluid pump.

sub a³ 25. A fluid pump comprising:

a housing defining a pumping chamber, a pumping chamber inlet port and a pumping chamber outlet port;

a central frame disposed in said pumping chamber;

a rotatable impeller disposed in said pumping chamber for rotation about said central frame;

a polarized electromagnetic means associated with said housing and said impeller for rotating said impeller about said central frame;

a plurality of diamagnets fixed with respect to said impeller;

a plurality of magnet means fixed with respect to said central frame and in magnetic communication with said plurality of diamagnets, to thereby stabilize said impeller by levitating magnetic forces.

26. The fluid pump of claim 25 wherein said plurality of diamagnets and said plurality of magnet means are oriented generally radially with respect to said central frame and said impeller, whereby said impeller is axially stabilized by levitating magnetic forces.

Amend C4
27. The fluid pump of claim 26 further comprising a plurality of magnet means fixed with respect to said housing and said impeller in a generally axial direction, whereby said impeller is radially stabilized by levitating magnetic forces.

Amend B3
28. The fluid pump of either claim 25, 26 or 27 wherein said magnet means are selected from the group consisting of permanent magnets, solenoids and electromagnets.

sub 24 29. The fluid pump of claim 28 wherein said impeller has a density substantially similar to the density of the fluid pumped by said fluid pump.

30. A fluid pump comprising:
a housing defining a pumping chamber, a pumping chamber inlet port and a pumping chamber outlet port;
a central frame disposed in said pumping chamber;
a rotatable impeller disposed in said pumping chamber for rotation about said central frame;
a polarized electromagnetic means associated with said housing and said impeller for rotating said impeller about said central frame;
a plurality of solenoids fixed with respect to said central frame;
a plurality of magnet means fixed with respect to said impeller and in magnetic communication with said plurality of solenoids, to thereby stabilize said impeller by levitating magnetic forces.

31. The fluid pump of claim 30 wherein said plurality of solenoids and said plurality of magnet means are oriented generally radially with respect to said central frame and said impeller, whereby said impeller is axially stabilized by levitating magnetic forces.

32. The fluid pump of claim 31 further comprising a plurality of magnet means fixed with respect to said housing and said impeller in a generally axial direction, whereby said impeller is radially stabilized by levitating magnetic forces.

33. The fluid pump of either claim 30, 31 or 32 wherein said magnet means are selected from the group consisting of diamagnets, permanent magnets, solenoids and electromagnets.

34. The fluid pump of claim 33 wherein said impeller has a density substantially similar to the density of the fluid pumped by said fluid pump.

35. A fluid pump comprising:

a housing defining a pumping chamber, a pumping chamber inlet port and a pumping chamber outlet port;

a central frame disposed in said pumping chamber; a rotatable impeller disposed in said pumping chamber for rotation about said central frame;

a polarized electromagnetic means associated with said housing and said impeller for rotating said impeller about said central frame;

a plurality of solenoids fixed with respect to said impeller;

a plurality of magnet means fixed with respect to said central frame and in magnetic communication with said plurality of solenoids, to thereby stabilize said impeller by levitating magnetic forces.

36. The fluid pump of claim 35 wherein said plurality of solenoids and said plurality of magnet means are oriented generally radially with respect to said central frame and said impeller, whereby said impeller is axially stabilized by levitating magnetic forces.

37. The fluid pump of claim 36 further comprising a plurality of magnet means fixed with respect to said housing and said impeller in a generally

axial direction whereby said impeller is radially stabilized by levitating magnetic forces.

38. The fluid pump of either claim 35, 36 or 37 wherein said magnet means are selected from the group consisting of diamagnets, permanent magnets, solenoids and electromagnets.

39. The fluid pump of claim 34 wherein said impeller has a density substantially similar to the density of the fluid pumped by said fluid pump.

Add B⁴ >